

**COST ESTIMATING ISSUES FOR
ADVANCED SYSTEMS AT
AIR FORCE RESEARCH LABORATORY
(AFRL)**

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AND
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**AFRL/IFSD
WRIGHT-PATTERSON AFB, OHIO**

PRESENTATION OUTLINE



AFRL AFFORDABILITY ACTIVITIES (*Dan Ferens*)

- Cost-Effectiveness in Laboratory Programs
- Tools and Techniques
- Current Programs and Efforts
- Future Directions

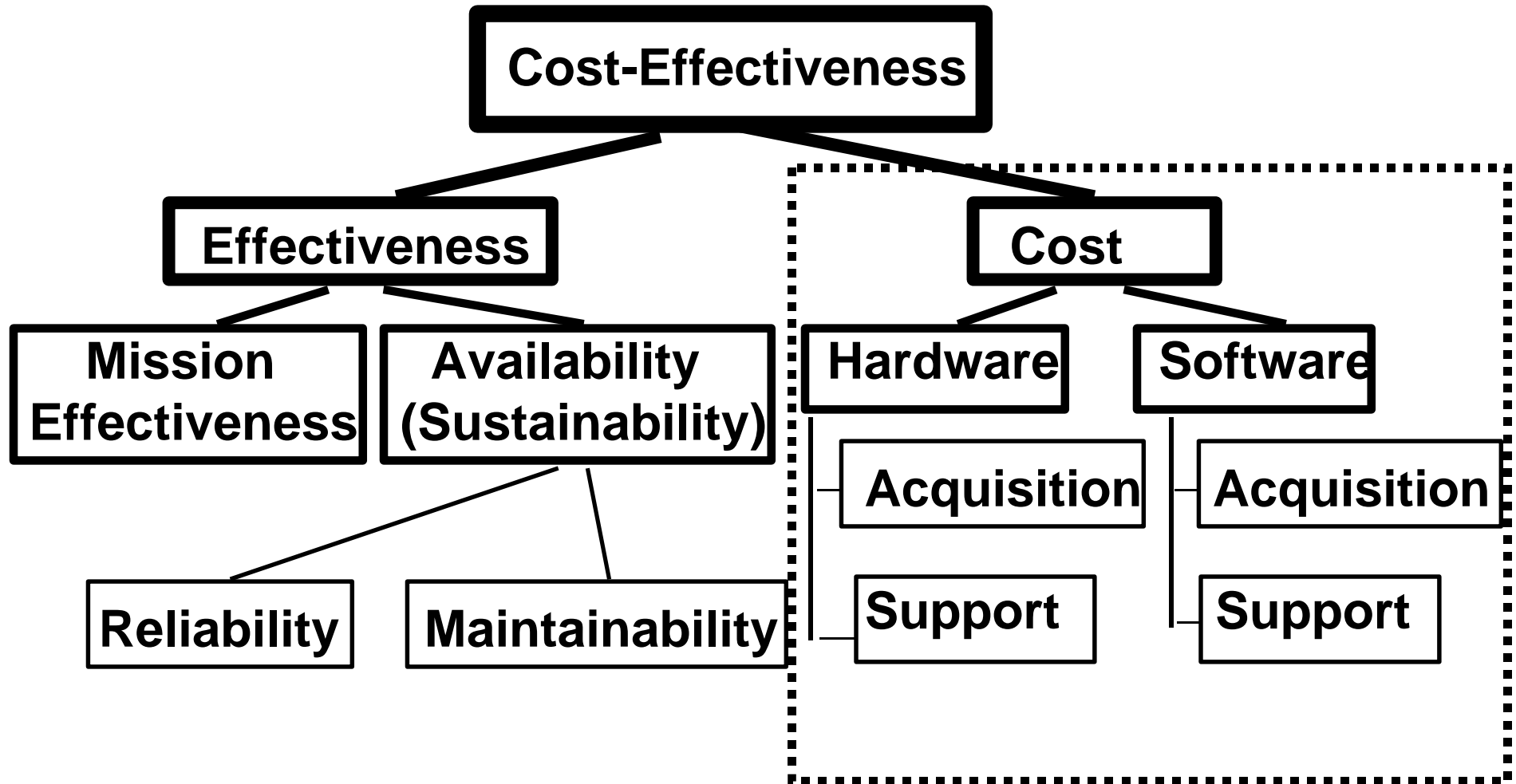


AFFORDABILITY IN THE COLLABORATIVE ENTERPRISE ENVIRONMENT (CEE) (*Gary Tolometti*)

- IDAPS Tool
- Fall 1998 Demonstration
- Future Plans



AFRL ANALYSIS HIERARCHY



**Affordability, or Cost As An Independent Variable (CAIV)
Is An Essential Component in Technological Trade Studies**

AFFORDABILITY IN AFRL

OBJECTIVE: Consider *Life Cycle Cost Analysis* of Hardware and Software for New Technology Programs



CHALLENGES:

1. Acquire Tools and Methodologies to Perform Life Cycle Cost Analyses For New Technologies, Along With Expertise



2. Perform Life Cycle Cost Analyses on Selected AFRL Programs

3. Insure AFRL Personnel *Committed* to Affordability and CAIV for *All* Laboratory Programs

AFFORDABILITY IN AFRL

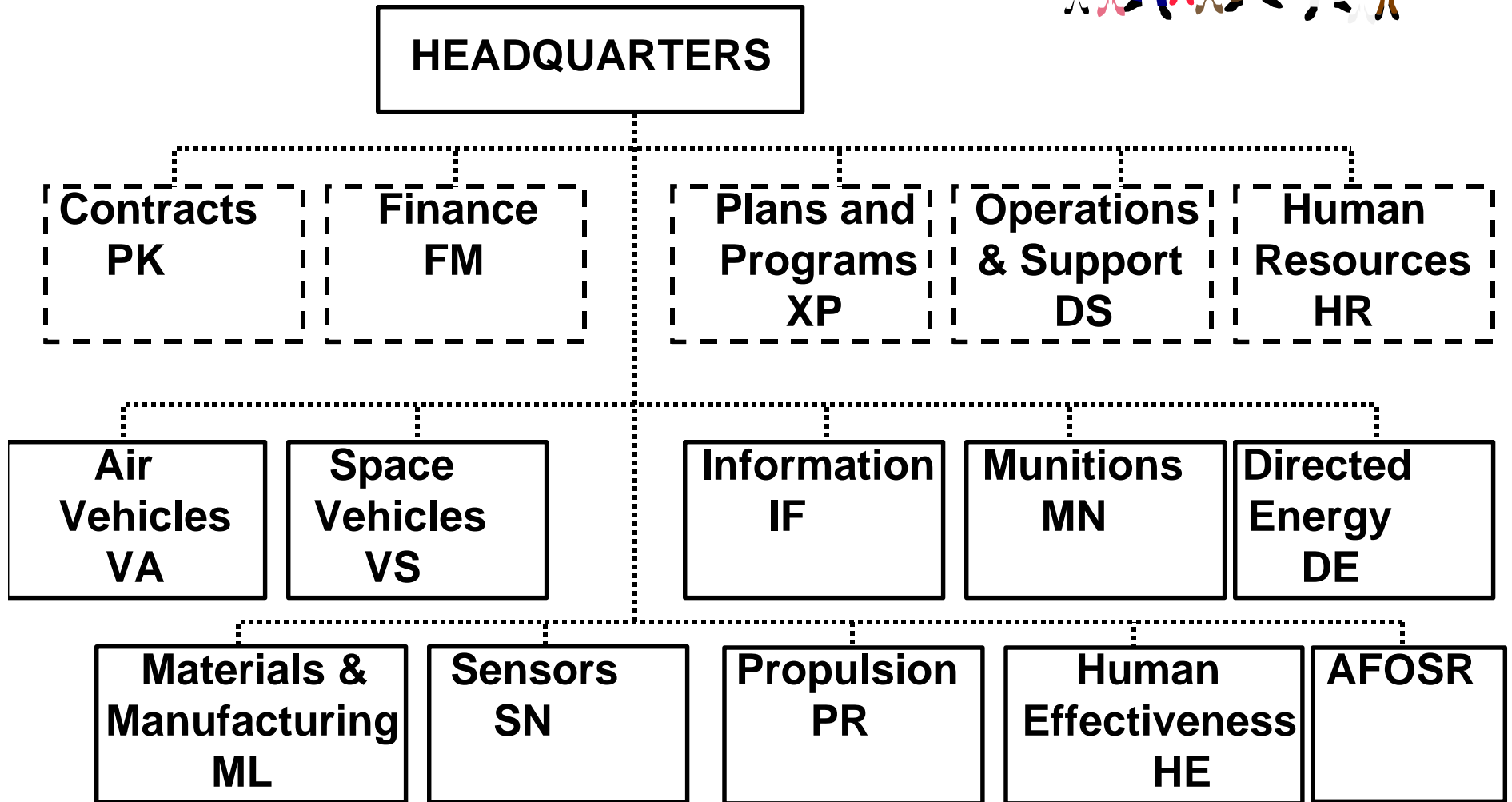
Tools and Techniques



<u>LEVEL</u>	<u>DEVELOPMENT</u>	<u>PRODUCTION</u>	<u>O&S</u>
System	<i>IDAPS*</i> <i>WS-ICM*</i> <i>ASCET*</i> <i>ACEIT</i>	<i>IDAPS*</i> <i>WS-ICM*</i> <i>ASCET*</i> <i>ACEIT</i>	<i>IDAPS*</i> <i>WS-ICM*</i> CORE JOSTE CASA
Hardware LRU/SRU	PRICE-H SEER-H D/CAP* CAICAT AAPCM*	PRICE-H SEER-H CAICAT	PRICE-HL SEER-HLC PathFinder* AFTOC (Database)
Component	PRICE-M	PRICE-M	(N/A)
Software	PRICE-S SEER-SEM COCOMO	(N/A)	PRICE-SL SEER-SEM LC

* Under Development In AFRL

AFRL ORGANIZATION



AFFORDABILITY IN AFRL Pilot Programs



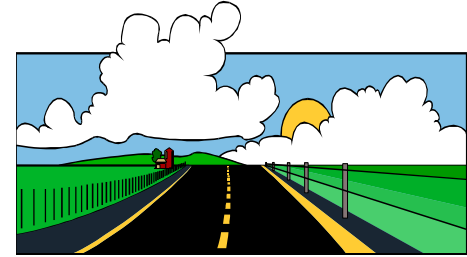
Directorate

Program

SN	Infrared Countermeasures
SN	Enhanced Recognition and Sensing Ladar
VA	Next Generation Transparency
VS	Improved Space Computer Program
HE	Multi-role Aircraft Support System
HE	Virtual Intelligent Tutoring System
ML	Advanced Laser Eye Protection
ML	Composites Affordability Initiative
PR	Advanced Motor Drive

AFFORDABILITY IN AFRL

Future Directions



- **AFRL Corporate Affordability Officer (CAO) Council**
 - Corporate Body For Developing & Implementing Affordability Strategy
 - Members From Each Technical Directorate
 - Guides *Culture Change* Across AFRL
 - Serves to Integrate, Coordinate AFRL Affordability Efforts
- **Sub-IPTs (e.g., IFSD CEE Affordability Sub-IPT)**
- **Training and Education**
 - Currently, James Gregory Associates Course in Integrated Product and Process Development (IPPD) Being Given to AFRL Personnel
 - Tool-Specific Courses
 - CAIV Training Also Being Given
- **Tools and Techniques**
 - Current Focus on Integrating Tools (e.g., IDAPS)
 - Some Application-Specific Tools Being Developed

SOFTWARE SUPPORT COST ESTIMATION



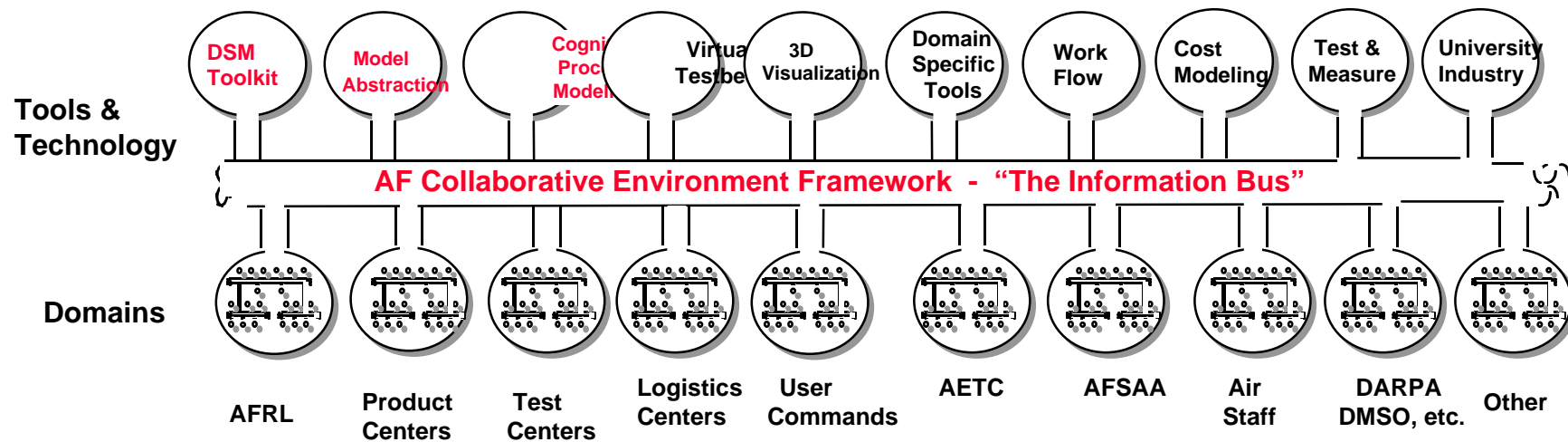
“THE LONG ROAD AHEAD”

AFRL Collaborative Enterprise Environment

Objective:

To demonstrate how a CEE increases the efficiency, control, insight and decision support of managers and decision makers across all levels of the AFRL Enterprise by allowing personnel and resources from multiple domains of expertise and functionality to seamlessly interact and collaborate.

Collaborative Enterprise Environment



Applicable Enterprises:

- Research & Engineering
- Simulation Based Acquisition
- Test & Evaluation
- Distributed Mission Training

Affordability Challenges

A unique set of problems needed to be addressed in the early stages of concept screening:

- What Is the Relative Cost of Competing Technologies/Designs When Conducting Cost Vs System Capability Tradeoffs of a Series of Alternative Designs?**
- What Is the Cost Impact of Transitioning New Technologies Into the Design?**

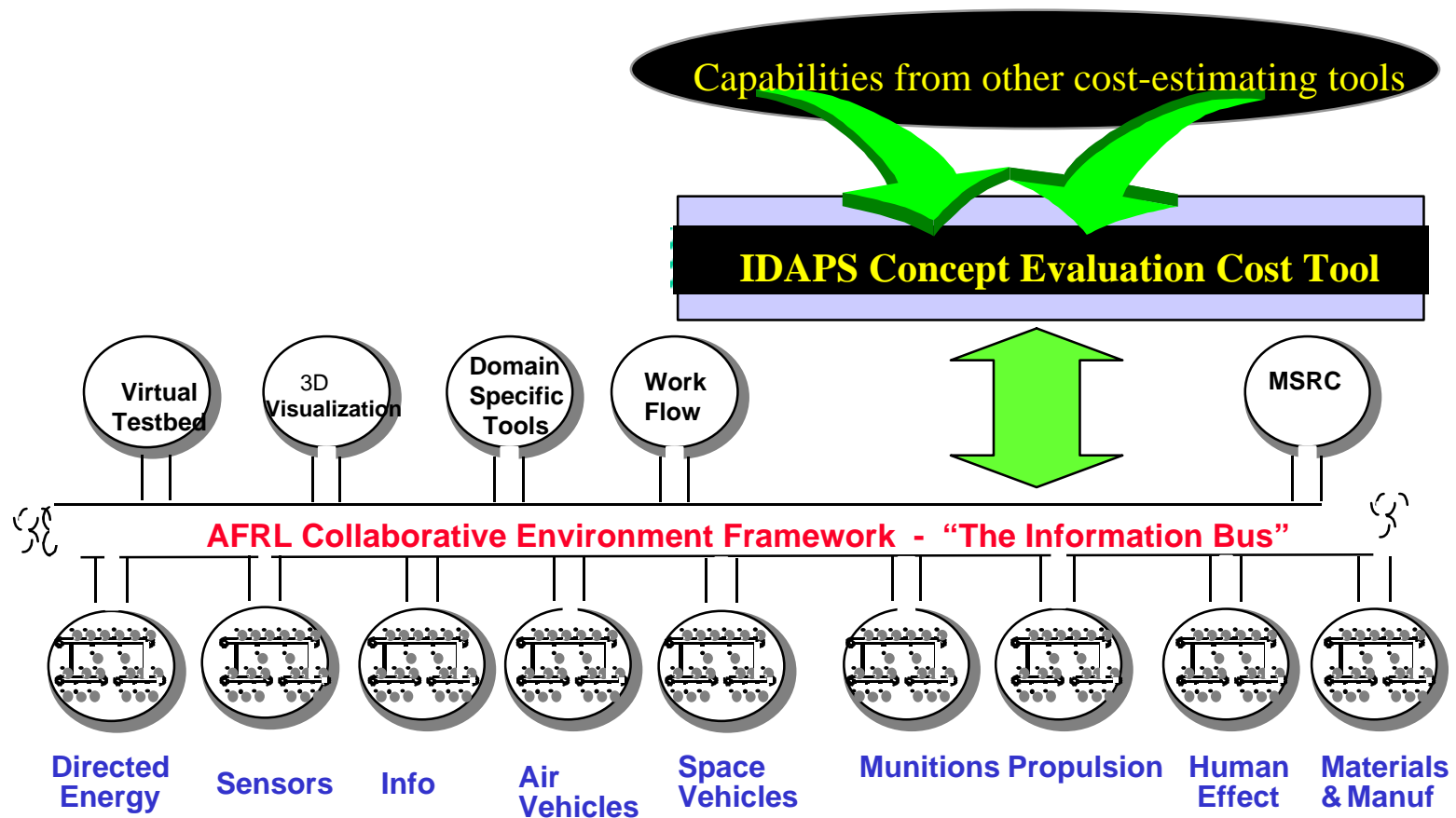
Integrated *Desktop Analysis and Planning* System Concept Evaluation Tool (ICE)

- **Integrated community accepted cost models:
SEER-H, SEER-SEM, CORE, DLR**
- **ICE is not a cost estimating tool**
- **Assists the analyst in identifying required input
information**
- **Automate LCC process**

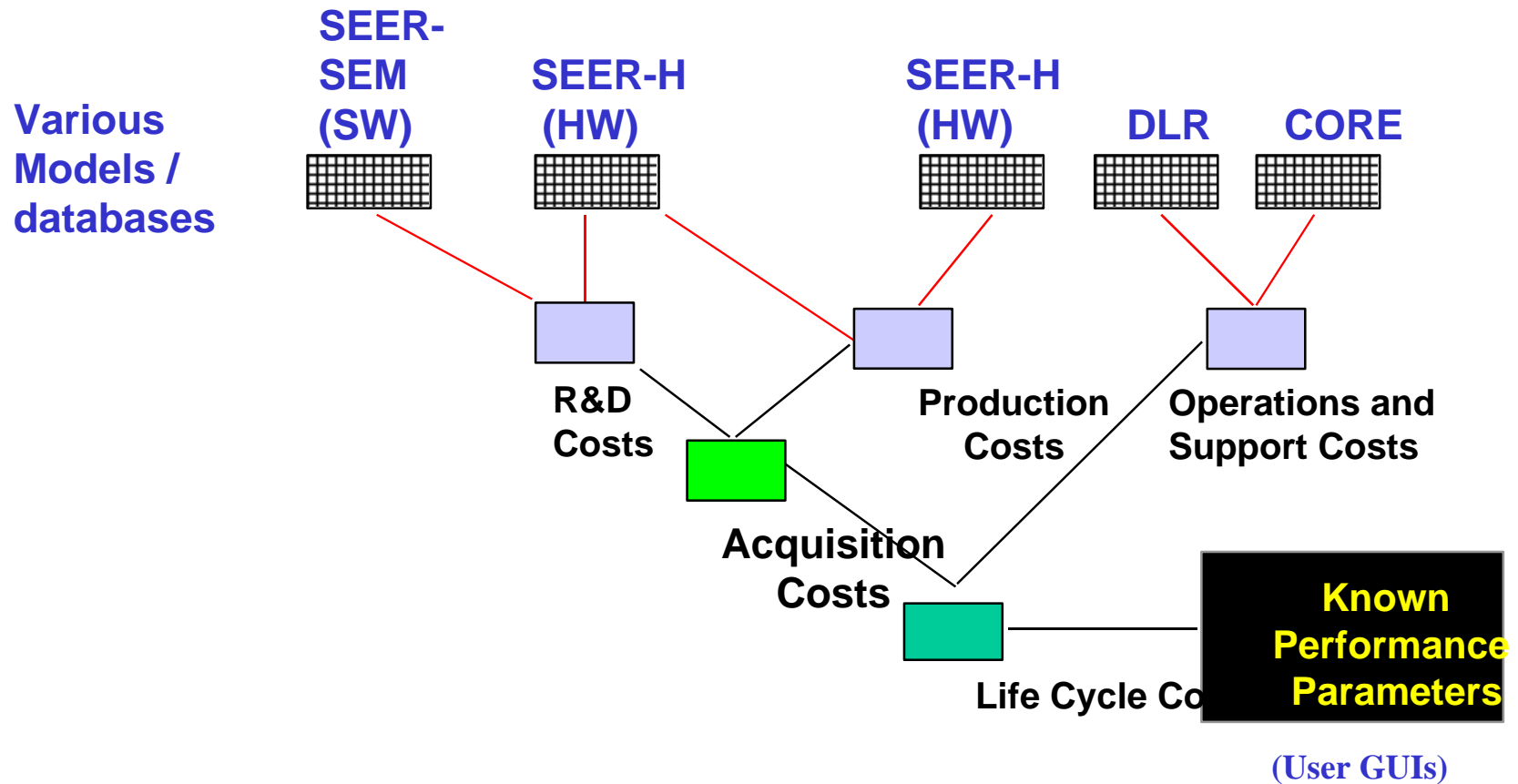
ICE Background

- **Accepted by ASC/FM**
 - **Models in ICE are widely accepted within the USAF financial community**
- **Used by ASC/XR to evaluate (cost) concepts for the 1998 Concept call**
- **Other organizations: ASC/XR, AFRL, F-15 SPO, ACC**

Interface with Collaborative Environment



ICE Framework



Frontier Technology SBIR I

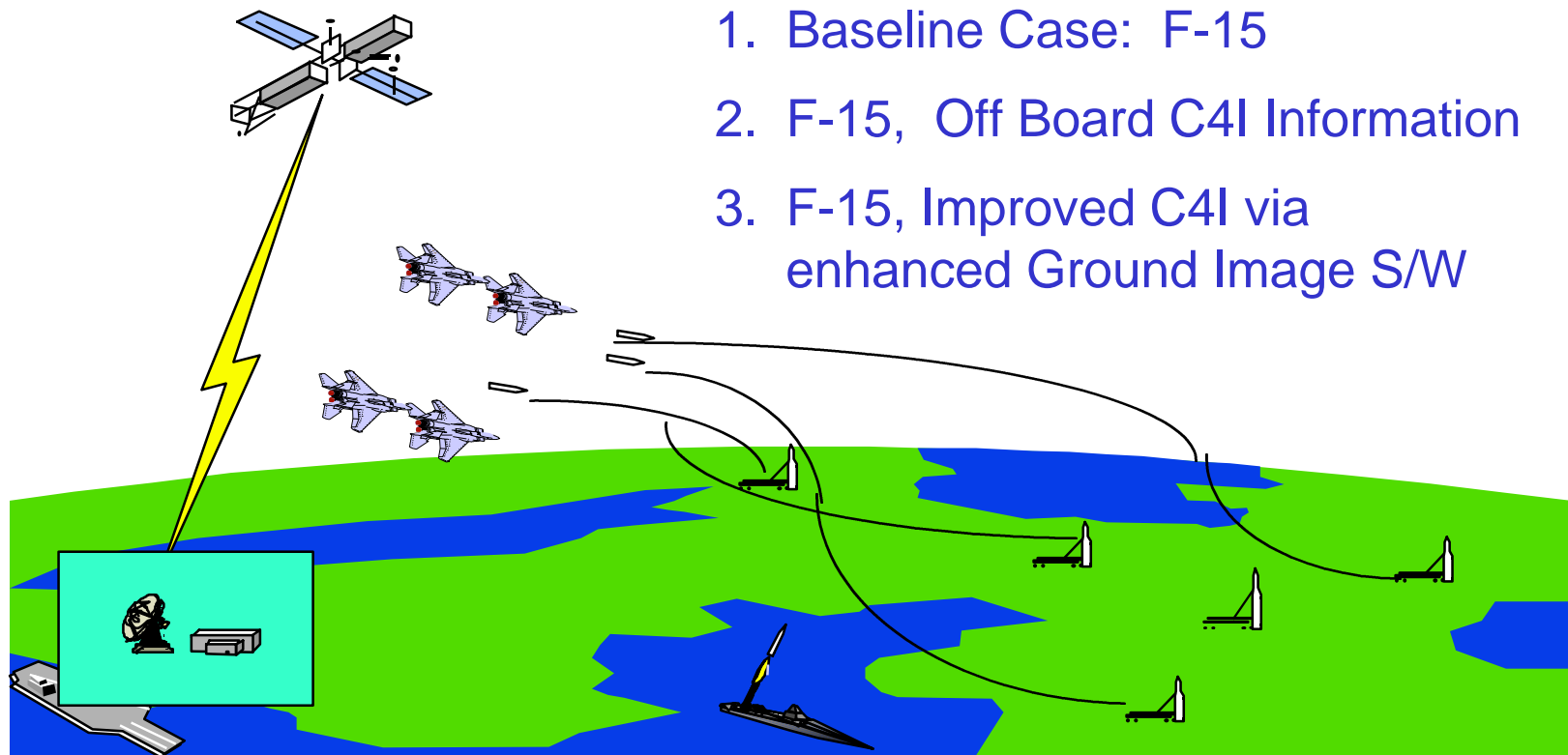
- **Integrate ICE into AFRL CEE**
- **Provide AFRL with an innovative tool with which the USAF can make a paradigm shift from performance-centered to affordability-centered research.**

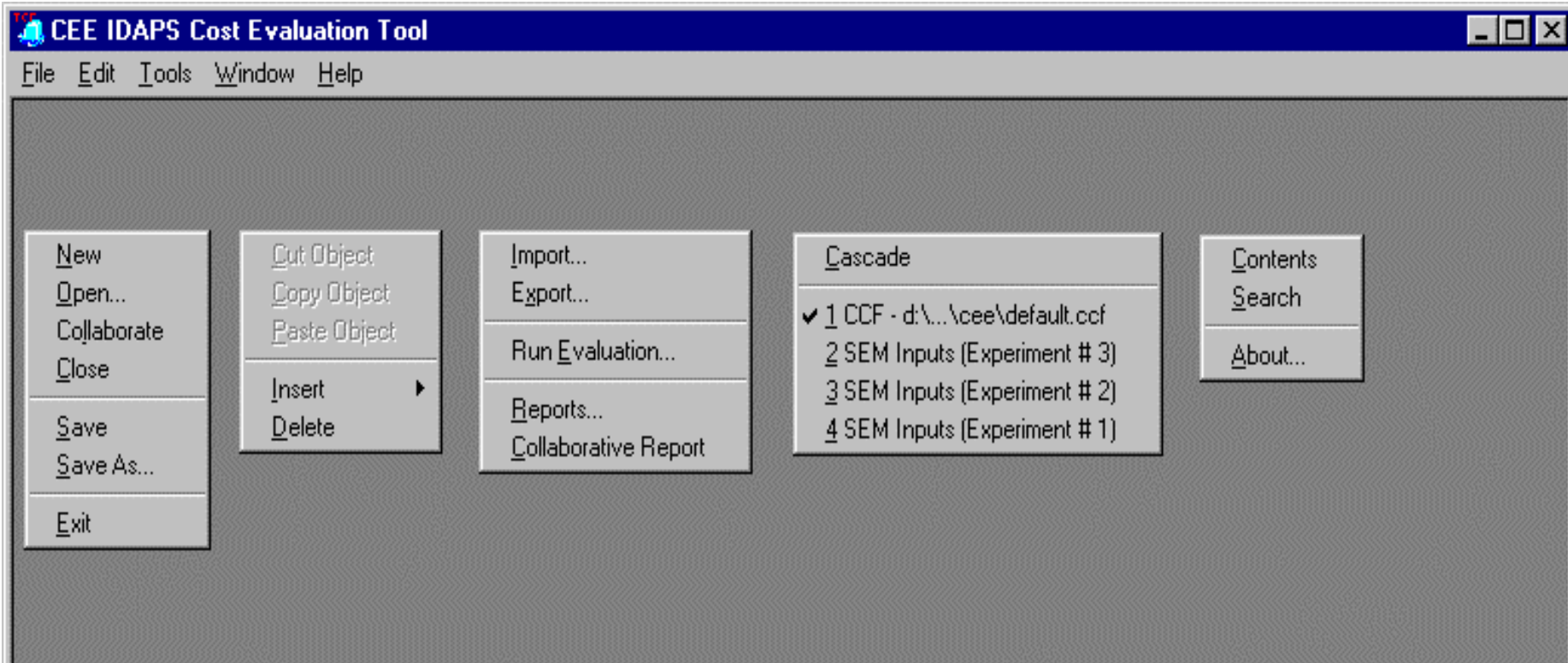
ICE

- **Demonstrate initial AFRL CEE functionality applied to a realistic “representative” laboratory example**
- **Demonstrate advantages of multi-disciplinary collaboration**
 - **Use of resources operating in native environments by experts that know how to use them**
 - **Increased management “insight” into engineering process**
 - **Collaboration of multiple levels of AFRL organizational levels (Decision makers, managers, engineers)**
 - **Reduced time to conduct design, evaluate and assess process**
 - **Reduced cost through resource reuse**
 - **Increased efficiency across AFRL enterprise**

CEE Sep 98 Experiment

Problem: Examined a limited set of technology alternatives to improve the ability to locate and destroy mobile targets.





Platform and LRUs

Acquisition and O & S

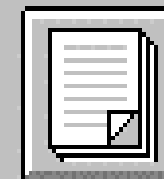
Systems

Over how many years will cost estimates be evaluated for this concept?

20



**Acquisition
Questionnaire**



**Advanced
O&S Adjustments
Questionnaire**

Platform and LRUs

Acquisition and O & S

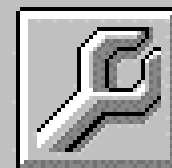
Systems

Platform modified or affected by concept.

F015E



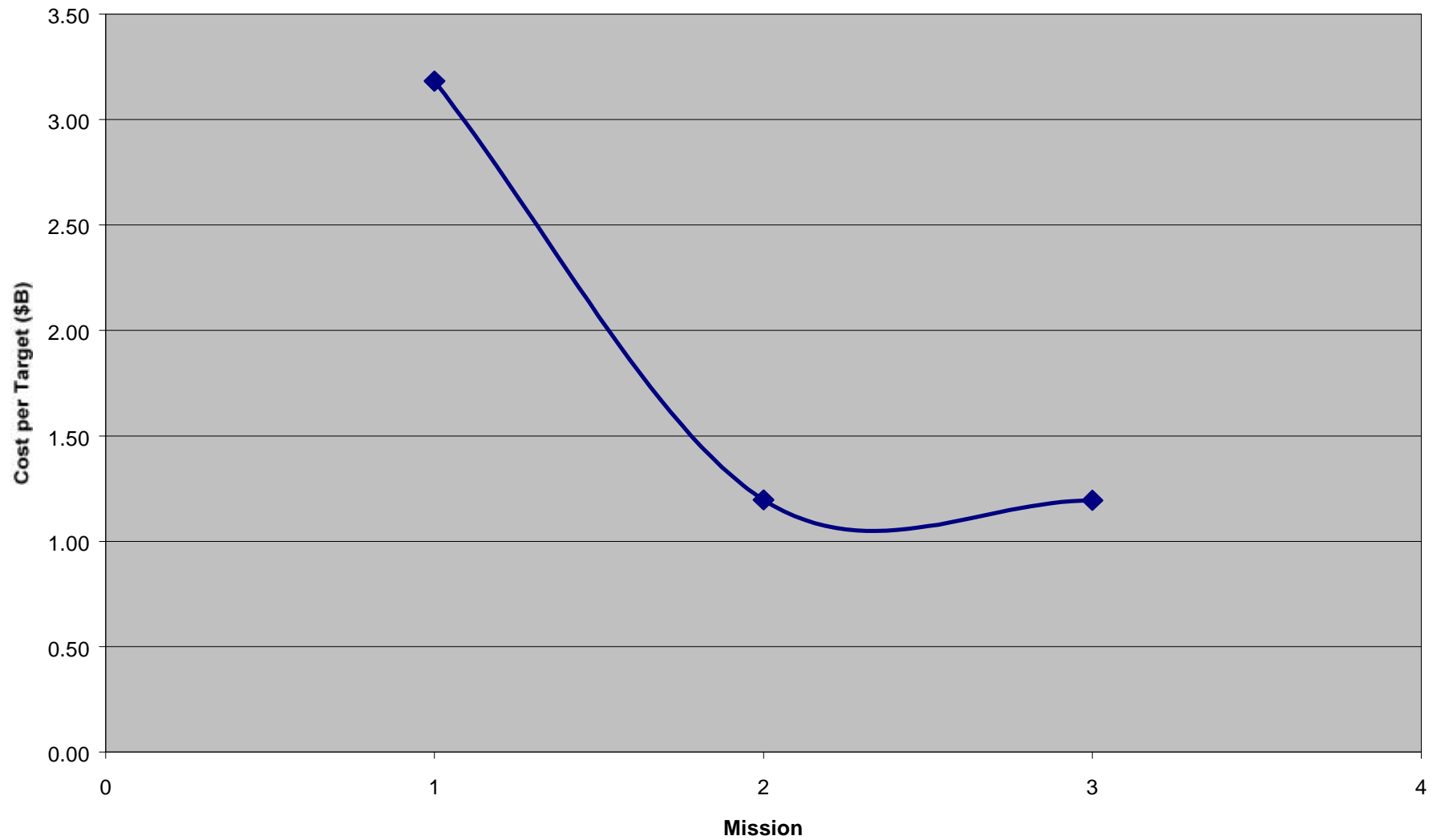
Platform



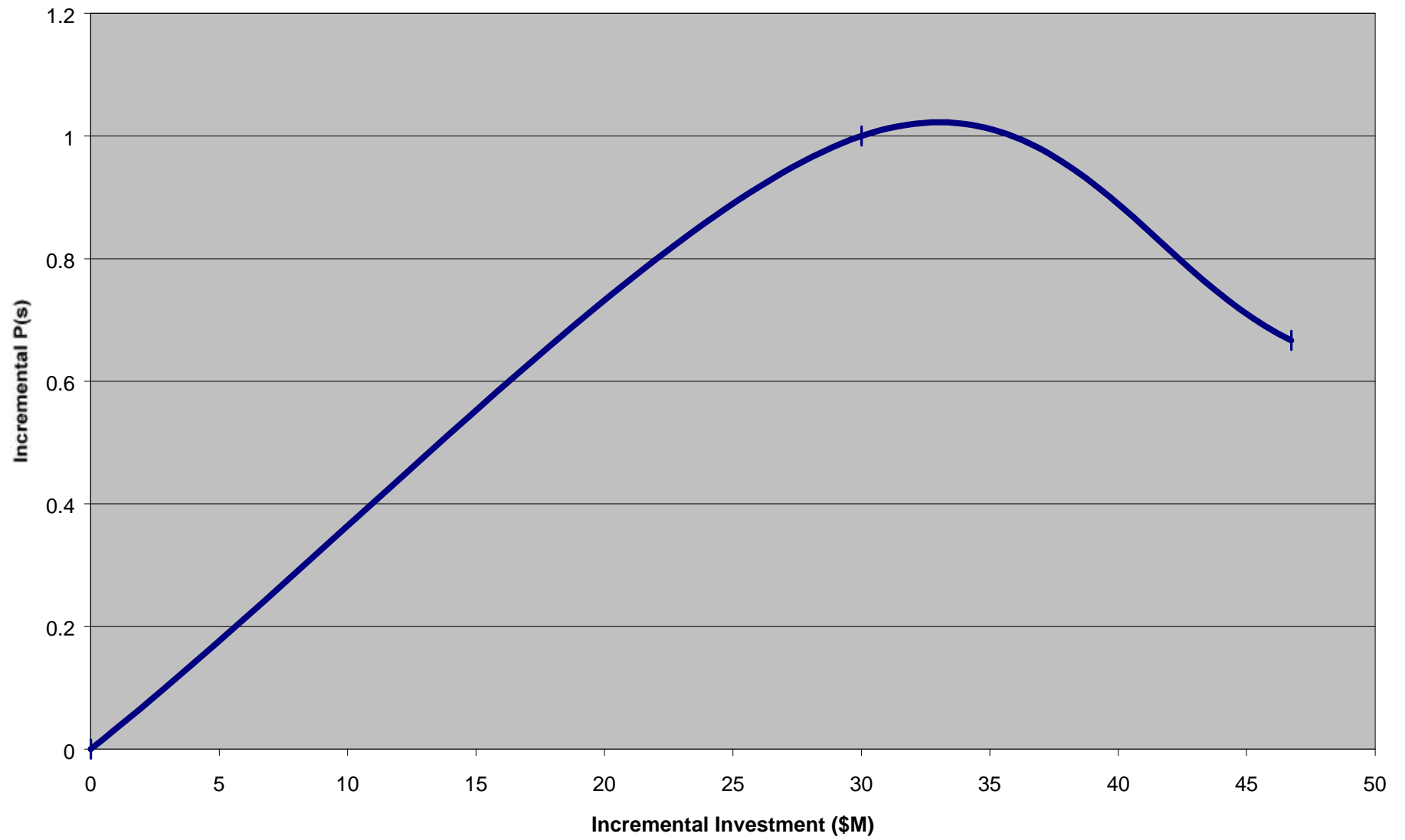
**LRU
Removal**

Select a platform then click the LRU Removal button to identify units that will be removed or replaced by this concept.

Mission Force Cost per Target Destroyed

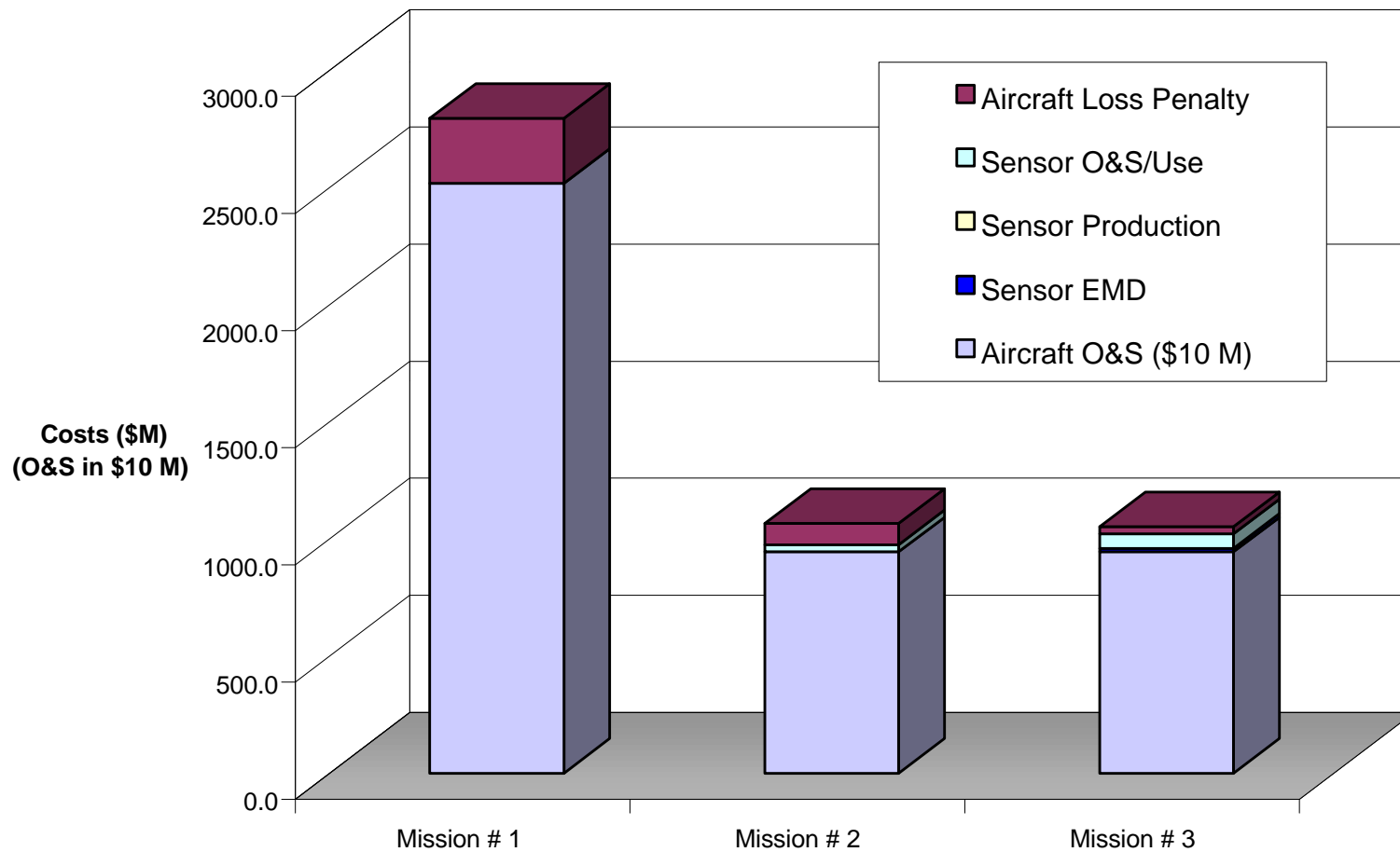


Marginal Effectiveness



Sample Output

F-15E Mission Force Costs



Future Improvements

- **Further experiments: Spring & Autumn 99**
- **ICE SBIR II**
 - **Create non-aircraft O&S capability**
 - **Create C2 capability**
 - **Insert PRICE-H and PRICE-S**
 - **Improve design interface (LINC, CORBA)**